REMARKS

Claims 1-12, 15-34, and 36-52 are pending. Claims 1, 15, 16, 18, 21, 25-27, 30, 33, and 36-38 have been amended. Claims 39-52 have been added. Claims 14 and 35 have been cancelled. No new matter has been introduced. Applications have filed a Request for Continued Examination (RCE) herewith. Reexamination and reconsideration of this application are respectfully requested.

In the January 10, 2006 Final Office Action, the Examiner rejected claims 1-12 and 14-38. Claims 1-12, 14-21, and 25-34 were rejected under 35 U.S.C. §103(a) as being obvious given U.S. Patent No. 6,289,217 to Hamalainen et al. ("Hamalainen") in view of U.S. Patent Application Publication No. US2003/0086371 to Walton et al. ("Walton"). Claims 22-24 were rejected under 35 U.S.C. §103(a) as being obvious given Hamalainen in view of a combination of Walton and U.S. Patent Application Publication No. US2002/0006167 to McFarland ("McFarland"). Claims 35-38 were rejected under 35 U.S.C. §103(a) as being obvious given Walton. These rejections are respectfully traversed.

35 U.S.C. §103(a) rejection – claims 1-12, 14-21, and 25-34

The Examiner rejected 1-12, 14-21, and 25-34 under 35 U.S.C. §103(a) as being obvious given Hamalainen in view of Walton. The Examiner alleged that Hamalainen is directed to a radio connection adapted to an environment changing over the connection in a cellular radio system where the radio traffic between the base station and the mobile station is arrange on a multiple access principle. [Office Action, p. 9, lines 1-4.] The Examiner also argued that Hamalainen discloses that for transmission, the source data is, according to mode 301, subjected to channel coding and interleaving so that a given data sequence is interleaved for the duration of a relatively short period. [Id., lines 6-8.] The Examiner further argued that a transmission of bursts is represented by nodes 302, 303, 304, and 305, and that a receiving device tries, in modes 306, 307, 308, and 309, to decode the data sequence after each received burst and sends, along with an acknowledgement, a message of the success or failing of the decoding for the transmitting device. [Id., lines 11-14.] The Examiner also argued that Hamalainen discloses a method based on changing the modulation, and the decision for changing the modulation order is based on the fact that the measured C/I ratio or

the value of the function Q and describing the connection quality is compared with given threshold values.

The Examiner stated that Hamalainen does not teach "wherein using the channel quality data to determine whether, how, and when to transmit at least a portion of the data pursuant to a second transmission selective mode includes selecting at least one particular carrier from amongst a plurality of candidate carriers." However, the Examiner stated that Walton discloses such limitation and that it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Hamalainen and Walton in the direction of the claims.

A. Claims 1-12, 14-19, and 25-34

Claim 1, as amended, recites (with emphasis added):

> "1. A method for facilitating adaptive transmissions by a base station in a multi-carrier system where a total available bandwidth is split into a set of subbands, each subband of the set of subbands comprising at least one subcarrier, the method comprising:
> - providing data to be transmitted to at least one transmission target;
> - determining whether likely trustworthy channel quality data is obtainable;
> when likely trustworthy channel quality data is not obtainable, **receiving a first channel quality report comprising an overall channel quality indicator, selecting a set of subcarriers for transmission, and selecting a modulation and coding scheme for the selected set of subcarriers based on the overall channel quality indicator;**
> when likely trustworthy channel quality data is obtainable, **receiving a second channel quality report comprising at least one subband channel quality indicator, selecting the set of subcarriers within at least one subband for transmission based on the at least one subband channel quality indicator, and selecting a modulation and coding scheme for at least one of the at least one subband selected for transmission based on a corresponding at least one subband channel quality indicator;**
> - transmitting a resource allocation control channel comprising a selected one of the first modulation and coding scheme and the second modulation and coding scheme, and the selected set of subcarriers; and
> - transmitting at least a portion of the data on subcarriers within the resource allocation using the selected one of the first modulation and coding scheme and the second modulation and coding scheme."

Hamalainen discloses a method and system for adapting a radio link to varying interference circumstances and to a varying quantity of source data. [Col. 2, lines 41-45.]

The method includes measuring connection quality and changing data transmission capacity based on the connection quality. [Col. 2, lines 61-65.] The radio link adaption is based on the connection quality, such that if the connection quality deteriorates, more capacity is reserved in the frame structure for the bearer (a data transmission path) in question. [Col. 3., line 64 – col. 4, line 1.] To utilize the larger data transmission capacity, the transmitting device increases the coding rate, changes the coding type or decreases the modulation order, so that in the data to be transmitted, there is more redundancy or a clearer modulation. [Col. 4, lines 1-5.]

In Hamalainen, FIG. 3 illustrates a method of transmitting and receiving bursts of data. For each transmission of the first through fourth data bursts 302, 303, 304, 305, the receiving device sends an acknowledgment indicating whether the data bursts 302, 303, 304, 305 have been successfully decoded (e.g., positive) or not decoded (e.g., negative). [Col. 9, lines 21-26.] For successful decoding of the data bursts 302, 303, 304, 305, the source data are subjected to channel coding and interleaving in mode 301. [Col. 9, lines 14-20.] If, however, the bursts are not successfully decoded 306, 307, 308, the transmitting device sends the next burst of the data sequence. [Col. 9, lines 26-29.] If all bursts are transmitted but the decoding is still unsuccessful 306, 307, 308, 309, the transmitting device sends an Automatic Request reQuest ("ARQ") for retransmission 310, followed by the original burst and its retransmitted copy being combined in mode 311. [Col. 9, lines 26-29.]

The Examiner alleged in the Office Action that this disclosure in Hamalainen teaches determining whether trustworthy data is obtainable. Applicants disagree and, as previously noted in Applicants' October 26, 2005 Amendment, respectfully submit that a determination of whether a data burst is correctly decoded using an acknowledgement is not the same as a determination of whether a trustworthy channel quality data is obtainable.

Moreover, Hamalainen does not disclose, when trustworthy data is not obtainable, receiving a first channel quality report comprising an *overall channel quality indicator, selecting a set of subcarriers for transmission, and selecting a modulation and coding scheme for the selected set of subcarriers based on the overall channel quality indicator.* Hamalainen also fails to disclose , when likely trustworthy channel quality data is obtainable, receiving a second channel quality report comprising *at least one subband channel quality*

indicator, selecting the set of subcarriers within at least one subband for transmission based on the at least one subband channel quality indicator, and selecting a modulation and coding scheme for at least one of the at least one subband selected for transmission based on a corresponding at least one subband channel quality indicator.

Instead, Hamalainen discloses

> "The transmission of bursts is represented by modes 302, 303, 304 and 305. The receiving device tries, in modes 306, 307, 308 and 309, to decode said data sequence after each received burst and sends, along with the acknowledgement, a message of the success (positive) or failing (negative) of the decoding for the transmitting device. The transmitting device sends the next burst connected to said data sequence only if the receiving device until then has not correctly decoded the data sequence. If all burst are transmitted but the decoding is still unsuccessful, there follows an ARQ (Automatic Repeat reQuest) type retransmission. The receiving device studies in mode 309 as to which of the bursts that it transmitted was poorest in quality and requests the transmitting device to retransmit said burst according to mode 310. In order to improve demodulation, the original burst and its retransmitted copy are combined in mode 311 by employing a known diversity-type method, where by multiplication and addition, there is obtained a result corresponding to the burst that was the target of retransmission, said result representing the highest correlation between the original burst and its retransmitted copy. The announcing and retransmission of the worst burst continues until the decoding succeeds, or until a given timer of the retransmission prevents further attempts at retransmission (not illustrated in the drawing)."

[Col. 9, lines 20-45.]

There is no such disclosure in Hamalainen of (a) selecting a modulation and coding scheme for the selected set of subcarriers *based on the overall channel quality indicator, or (b)* selecting the set of subcarriers within at least one subband for transmission based on the at least one subband channel quality indicator, and selecting a modulation and coding scheme for at least one of the at least one subband selected for transmission *based on the corresponding at least one subband channel quality indicator.*

Walton does not make up for the deficiencies of Hamalainen. Walton discloses an adaptive rate control method for an OFDM communication system. [Walton, Abstract.] Various types of metrics are derived and used to select the proper rate for the data transmission. [Para. 10, lines 3-5.] The data rate is determined by a data rate control and the coding and modulation scheme is determined by a coding/modulation control, both of which are provided by a controller based on a rate received from a receiver. [Para. 21, lines 6-10.]

A channel estimator receives and processes the data samples to provide various types of metrics indicative of various characteristics of the communication channel. [Para. 23, lines 2-5.] A rate selector receives the channel metrics and determines the suitable rate that is indicative of a specific set of values for a set of transmission parameters. [Para. 24, lines 1-7.] Walton does disclose determining a data rate control, but does not make such disclosure of (a) selecting a modulation and coding scheme for the selected set of subcarriers based on the overall channel quality indicator, or (b) selecting the set of subcarriers within at least one subband for transmission based on the at least one subband channel quality indicator, and selecting a modulation and coding scheme for at least one of the at least one subband selected for transmission based on the corresponding at least one subband channel quality indicator.

Accordingly, claim 1 distinguishes over Hamalainen in combination with Walton. Independent claims 16, 28, and 30 contain distinguishing limitations similar to those of claim 1 and therefore also distinguish over Hamalainen in combination with Walton. Claims (a) 2-12 and 15, (b) 17-19, (c) 29, and (d) 31-34, all depend, directly or indirectly (through claim dependencies), from claims 1, 16, 28, and 30, respectively, and therefore also distinguish over Hamalainen in combination with Walton for at least the reasons disclosed above with respect to claim 1. Therefore, applicants respectfully submit that the rejection of claims 1-12, 14-19, and 25-34 under 35 U.S.C. §103(a) should be withdrawn.

B. Claims 20 and 21

Claim 20 recites (with emphasis added):

> 20. A method for facilitating adaptive transmissions in a multi-carrier, multi-dimension domain, comprising:
> - providing data to be transmitted to at least one transmission target;
> - determining whether likely trustworthy channel quality data is obtainable;
> - when likely trustworthy channel quality data is not obtainable, determining at least whether, how, and when to transmit at least a portion of the data pursuant to a first transmission selection mode;
> - when likely trustworthy channel quality data is obtainable, at least attempting to obtain channel quality data;
> - when channel quality data is obtained, using the channel quality data to determine at least whether, how, and when to transmit at least a portion of the data pursuant to a second transmission selection mode, wherein using the channel quality data to determine whether, how, and when to transmit at least a portion of the data pursuant to **a second transmission selection mode includes selecting a first**

modulation and coding scheme for use with a first carrier and a second modulation and coding scheme for use with a second carrier to transmit at least a portion of the data.

The Examiner has alleged that Hamalainen discloses changing the modulation and coding scheme based on whether data bursts are successfully received and decoded. However, only a single modulation and coding scheme would be utilized according the Hamalainen. Combining Hamalainen with Walton does not make up for the deficiencies of Hamalainen. The proposed combination would differ from claim 20, which requires **selecting a first modulation and coding scheme for use with a first carrier and a second modulation and coding scheme for use with a second carrier to transmit at least a portion of the data when channel quality data is obtained.** Therefore, claim 20, and claim 21 depending therefore, distinguishes over Hamalainen, alone or in combination with Walton. Accordingly, applicants respectfully submit that the rejection of claims 20 and 21 under 35 U.S.C. §103(a) should be withdrawn.

35 U.S.C. §103(a) rejection – claims 22-24

Claims 22-24 were rejected under Hamalainen in view of a combination of Walton and McFarland. The Examiner argued that the combination of Hamalainen and Walton teaches most of the elements of claims 22-24. The Examiner alleged that the combination of Hamalainen and Walton does not teach that "transmitting a signal to the transmission target includes transmitting a fast sounding channel evaluation signal such that the transmission target can evaluate a time-frequency response of the multi-carrier domain as claimed." However, the Examiner stated that McFarland discloses such limitation and that it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Hamalainen, Walton, and McFarland in the direction of claims 22-24.

Claims 22-24 depend indirectly from claim 20, and therefore distinguish over the combination of Hamalainen and Walton for at least the reasons discussed above with respect to claim 20. McFarland does not make up for the deficiencies of Hamalainen and Walton. McFarland discloses a multi-carrier communication system using variable symbol rates and numbers of carriers. However, the combination of Hamalainen, Walton, and McFarland does

not disclose, teach, or suggest *selecting a first modulation and coding scheme for use with a first carrier and a second modulation and coding scheme for use with a second carrier to transmit at least a portion of the data when channel quality data is obtained.* Therefore, claims 22-24 distinguish over the combination of Hamalainen, Walton, and McFarland.

35 U.S.C. §103(a) rejection – claims 35-38

Claims 35-38 were rejected under 35 U.S.C. §103(a) as being obvious given Walton. The Examiner argued that Walton teaches various types of metrics can be used in different manners to adaptively control the rate of a data transmission. The Examiner further alleged that Walton does not teach the claimed limitation "when the channel coherence time indicates that the multi-carrier channel is changing too quickly,..." However, the Examiner stated that it would have been obvious for one of ordinary skill in the art at the time of the invention that the feedback control information can be modified to send back the channel coherence time status. The Examiner further argued that it would have been obvious to one of ordinary skill in the art at the time of the invention that the Walton teachings could be modified to include in the feedback control information the average channel quality indicator (e.g., channel metrics) across the multi-carrier as claimed to determine a suitable "rate" that may be used for all frequency subchannels of an OFDM system. Claim 35 has been cancelled and new claim 45 has been added.

New claim 45 recites (with emphasis added):

> 45. A method for use by a mobile communications unit that communicates in a multi-carrier system, comprising:
> determining a channel coherence time attribute for a multicarrier communication channel in a multicarrier communication system;
> **determining an identification of the mobile communications unit into one of a first type and a second type based on the coherence time attribute;**
> transmitting a message indicating the classification made by the mobile communications unit;
> **in response to the identification being into the first type, determining a band-average channel quality for an overall bandwidth of a multicarrier communication channel, and transmitting the band-average channel quality;** and
> **in response to the identification being into the second type, determining a channel quality for at least one subband within the multicarrier communication channel, wherein a subband comprises at least one subcarrier, transmitting the channel quality for the at least one subband, and transmitting a corresponding subband index for the at least one subband.**

Walton discloses that some types of metrics are derived that relate to different characteristics of a communication channel, such as SNR, frequency selectivity, and time selectivity. [Para. 10, line 3 – para. 11, line 3.] Each channel characteristic may be quantified by one or more different channel metrics. [Para. 11, lines 3-5.] Pre-detection SNR and post-detection SNR may be used to quantify SNR, delay spread and coherence bandwidth may be used to quantify frequency selectivity, and coherence time and Doppler spread may be used to quantify time selectivity. [Para. 11, lines 5-9.] One type of metric relates to the performance of the data transmission, and performance may be quantified by frame error rate (FER) and some other decoder metrics. [Para. 11, lines 9-12.]

However, Walton does not determine *an identification of a mobile communications unit into one of a first type and a second type based on the coherence time attribute.* Walton also fails to disclose, in response to the identification being into the first type, *determining a band-average channel quality for an overall bandwidth of a multicarrier communication channel, and transmitting the band-average channel quality.* Walton further fails to disclose, in response to the identification being into the second type, *determining a channel quality for at least one subband within the multicarrier communication channel, wherein a subband comprises at least one subcarrier, transmitting the channel quality for the at least one subband, and transmitting a corresponding subband index for the at least one subband.*

Moreover, with respect to the determining of the suitable rate that the Examiner has alleged is obvious, applicants respectfully submit that the Examiner is using impermissible hindsight. It is well settled that a reference must provide some motivation or reason for one skilled in the art (working without the benefit of the applicant's specification) to make the necessary changes in the disclosed device. The mere fact that a reference *may* be modified in the direction of the claimed invention does not make the modification obvious unless the reference expressly or implicitly teaches or suggests the desirability of the modification. In re Kotzab, 55 U.S.P.Q.2d 1313, 1317-18 (Fed. Cir. 2000); In re Fitch, 23 U.S.P.Q.2d 1780, 1783 (Fed. Cir. 1992); In re Mills, 16 U.S.P.Q.2d 1430, 1432 (Fed. Cir. 1990).

The cited Walton reference fails to meet the basic requirement for a finding of obviousness established by the courts in Kotzab, Fitch, and Mills. Specifically, Applicants

note that sending back the channel coherence time status is neither disclosed nor suggested by Walton and therefore would not have been obvious.

Accordingly, claim 45 distinguishes over Walton. Claims 36-38 depend directly from claim 45 and therefore also distinguish over Walton. Therefore, applicants respectfully submit that the rejection of claims 36-38 under 35 U.S.C. §103(a) should be withdrawn

Applicants believe that the foregoing amendments place the application in condition for allowance, and a favorable action is respectfully requested. If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Chicago telephone number (312) 577-7000 to discuss the steps necessary for placing the application in condition for allowance should the Examiner believe that such a telephone conference would advance prosecution of the application.

Respectfully submitted,

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